ZANZIBAR PROTECTORATE.

ANNUAL REPORT

ON THE

PUBLIC HEALTH DIVISION

FOR THE YEAR,

1917.

ZANZIBAR.

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Report on the Public Health Division for the year 1917.

PART I.—SANITATION.

ZANZIBAR TOWN.

General—For administrative purposes early in the year the town was divided into 4 districts which for convenience are known as A. B. C. and D. D. or the 'Ngambo district is separated from the other 3 districts, which are the town proper, by the Creek. The boundary between A. and B. is formed by the Sokomohogo Road and its continuations on the one side to the sea front by the Customs House and on the other to the Creek by the Stables. B and C are divided by the Kiponda Road and its continuations respectively to the Creek by the Slaughter House and to the sea front near Captain Bardo's house.

In A District there are some 600 stone houses. It takes in the Shangani, Bhagani and Vuga quarters. The Shangani quarter is the chief residential part of the town for Europeans. There are also a number of Arab and Goan residences here. The European and Native Hospitals are in Shangani. There are a few European residences in Bhagani which is however chiefly Asiatic. Vuga is almost entirely native African or Swahili.

B District, which takes in Hurumzi, Sokomohogo and Mkunazini is the most congested area of the town and contains some 1238 stone houses. The Government Offices and the Palace of H. H. the Sultan as well as a few European residences are in Hurumzi. The Universities' Mission and Hospital are in Mkunazini. B District is essentially Asiatic and largely consists of Indian Bazaar. Most of the Cow-sheds in the town are in this district, also the Public Markets and Slaughter House.

C District, which takes in Malindi, Kokoni and Funguni contains some 626 stone houses. The population here is a particularly mixed one. The Shark Market is situated in Malindi whilst in Kokoni we find hide curers and dealers, pottery workers, lime burners and cattle and goat lairies. The dhow anchorage is off Malindi where a large portion of their cargo is landed. After discharging, the dhows are careened on the Malindi and Funguni beach for repairs. The possibility of infected rats being brought by these dhows from such ports as Bombay and obtaining an easy footing in this district peopled as it is with a cosmopolitan community of dirty habits is a

constant anxiety during the N. E. monsoon. If it could be arranged it would be advisable for all dhows arriving from any port where plague is present to be allowed to discharge only under supervision at one place which could be rendered rat-proof and where if necessary the cargo could be efficiently disinfected, the dhows being de-ratted before being permitted to be beached.

D District or 'Ngambo is an extensive one and probably about one half of the total population of the town lives here. There are no figures available giving the actual census figures unfortunately. There are some 612 stone houses in this district occupied chiefly by Indian shopkeepers but the majority of the inhabitants, who are Swahilis, live in native huts. The almost entire absence of any roads in this district and the extreme irregularity with which the huts have been built with narrow sandy lanes between render systematic inspection and all sanitary measures very difficult.

The Chief Inspector, Mr. F. de Sousa, is the executive officer responsible under the Medical Officer of Health for the General Sanitation of the Town. All reports from the Inspectors in the first instance are received and investigated by him and if necessary referred to the Medical Officer of Health. In the ordinary course he makes out all nuisance notices, and if necessary, after bringing the case before the Medical Officer of Health, he institutes proceedings before the Magistrate.

One Sanitary Inspector is in charge of each of the districts A. B. C. and D. with his gang of scavengers and carters. He is directly responsible for the general sanitary condition of his district, street cleaning, removal of refuse, oiling of cesspools, etc., etc., and for the detection and removal of nuisances.

In each district there is in addition one, or more, Junior Inspectors whose duty it is to make a house-to-house inspection of all premises in his Sub-district once a week for the detection of mosquito breeding places in particular but also of any other nuisance which it is his duty immediately to report to the Inspector in charge of the district.

Other Inspectors are engaged on trapping, poisoning and purchasing rats and in dealing with rat infested premises by destroying rat warrens.

All new Inspectors engaged during the year to fill vacancies have been engaged on a reduced scale of pay before their appointment on agreement until, after a course of instruction in the laboratory under the Economic Biologist, Dr. Aders, who has been good enough to undertake this work, and later in the field, they are able to identify the various commoner kinds of mosquitoes in their adult or larval condition, and are familiar with the habits of mosquitoes, their haunts and how to look for them and know how to carry out the routine duties of an inspector.

In Table I the routine work done during the year under the head General Sanitation is shewn.

TABLE I.

GENERAL SANITATION. TOWN. 1917.

Inspectors	15
Inspections of premises	49,008
General Nuisance Notices...	624
Mosquito Nuisance Notices	616
General Nuisance Convictions	19
Mosquito Nuisance Convictions	6
Houses cleaned and disinfected	38
Latrines regularly cleaned	25
Public Urinals regularly cleaned	5
Average number of Cesspools oiled weekly ...	93
Cesspools filled in	2
Wells filled in	3
Cart loads of refuse removed	43,933
Rats collected, trapped and poisoned	22,136
Pariah dogs destroyed	86
Burials of Paupers and others carried out ...	69

Water Supply.—The water supply of the town is derived from a spring some 3 or 4 miles from the town. The water is of great purity but the distribution owing to the lack of fall leaves much to be desired. Owing to the small head it is not possible for the water to be laid on to houses, street hydrants have to be depended on, and even these are impossible in the higher parts of the town. The supply is estimated to be about 400,000 gallons in 24 hours. This is inadequate for the needs of the town when the large amount required by shipping is taken into consideration and until this is augmented the installation of a proper sewerage system is out of the question. It is hoped that the additional supply will be obtainable before very long from the Chukwani reservoir which is, however, not of equal purity with the present supply, the chlorine content being somewhat higher. The yield from this latter source remains to be proved although the available evidence points to its being adequate. The town wells serve as a supplementary supply in the case of fire and for religious purposes but the sewage polluted water in these wells is quite unfit for domestic use. In laying the water supply pipes sufficient care has not been given to the possibility of pollution of the supply by a defective pipe and it is no uncommon thing to find the water pipe laid in the bottom of a drain. In such a position, should a leaky joint develop in the pipe, with a negative pressure being established, an indraw of filthy water from the drain is bound to occur.

Drainage.—The few existing drains, which deal with sullage water from kitchens and baths and with sewage from some stables and cowsheds, with their twists and turns, imperceptible fall, uneven irregular internal surfaces and absence of flushing arrangements have

only to be seen to be condemned and emphasise the urgent need for a properly constructed sewerage system for the town. Many of these drains discharge into the Creek, the foul contents trickling out to be distributed over the sides of the Creek by the rising tide and only partially removed as the tide ebbs, a stinking morass remaining during the hours of low water. Some improvement undoubtedly may be expected from filling in the sides of the Creek and grading them to a central cement channel but under no circumstances will such a channel be suitable for dealing with sewage, it being impossible to secure an adequate fall. Other drains discharge on to the beach of the roadstead. These are less objectionable but they are constantly becoming silted up with sand and complaints are frequent.

I believe it would be possible to connect up the greater part of the town proper, if not the whole of it, excluding the 'Ngambo district, to a main sewer outlet or reservoir at Shangani point capable of holding the total sewage of 6 hours and discharging into deep water on the ebbing tide. Such an arrangment as this would enable adequate fall to be given by taking advantage of the 15 feet rise and fall of tide. Although the installation of water carriage of sewage is not feasible until a further water supply has been obtained it would be well if the engineering problems could be considered and solved in anticipation of that event.

Cesspools.—With the exception of the few drains referred to in the last paragraph and the one or two properly constructed drains to the sea from European residences on the sea front, cesspools are the accepted means of disposing of household waste water from baths, kitchens, etc., and the whole town proper is literally honeycombed with these and the equally universal "choo" or privy pit. Owing to the extraordinary porosity of the soil and sub-soil many of these cesspools have been receiving large quantities of liquid daily for years without the necessity for their being emptied arising. For this reason, so long as it is recognised that the sub-soil is already thoroughly foul and that the wells are polluted and unfit to be used except perhaps for washing purposes, properly constructed cesspools may be considered far preferable to the existing bad drains. It must however be remembered that all parts of the town area are not equally fortunate as regards a porous sub-soil and it is found in certain places that the cesspools require to be emptied with great frequency.

The importance of cesspools as breeding places for Culicine mosquitoes, *Culex fatigans* in particular, has been pointed out in previous reports and the advantages to be expected from inserting some form of S or U or yard gully trap at all cesspool inlets was mentioned by Dr. Curwen in his report for 1916. During the year a certain number of these gully traps have been fixed but unless these traps are placed in such a position as to be readily inspected and kept clean they are likely to cause a worse nuisance than the original cesspool. It has been impossible to obtain many of these

traps however and the experiment has not been extensive. Given good workmanship in fitting suitable traps and adequate care in maintaining them in good order, in the absence of any other inlet to the cesspool except a mosquito proof covered man-hole, the use of these traps would undoubtedly do away with the necessity for the somewhat extensive and expensive oiling otherwise required. In the absence of these conditions suitable air breaks in the course of the drain pipes to cesspools to prevent foul air gaining access to the house must be insisted on and the fixing of proper reinforced concrete man-hole covers to the cesspools. The air-breaks on the pipes facilitate the early detection of blocking and the man-hole makes possible the inspection, oiling and if necessary emptying of the cesspool.

That the regular oiling weekly of cesspools is an effective means of ridding a neighbourhood of *Culex fatigans* has been amply proved elsewhere and the systematic carrying out of this measure here has been equally encouraging. Early in the year a detailed inspection was made of all cesspools already fitted with proper man-holes, the internal dimensions ascertained and the amount of oil required to give an effective film, calculated on the basis of 1 pint of a mixture of kerosine and crude oil to each square yard of liquid surface, apportioned to each cesspool. It should perhaps be mentioned that for the oiling to be effective it is necessary that after pouring on the oil the contents of the cesspool must be well stirred. The necessity for the man-hole is thus apparent. After inspection each cesspool received a number and all particulars regarding it were carefully registered. It then became the duty of the Inspector in charge of the district assisted by one or two labourers to inspect each registered cesspool in his district once weekly, as far as possible always inspecting the same ones on the same day every week. If the cesspool was found to contain liquid the apportioned amount of oil was applied and the contents well stirred, if there was no liquid this was noted no oil being required. The number of registered cesspools in January was 97; this number had risen to 143 in December. Whenever an opportunity occurred the owner of a defective cesspool was required to fit his cesspool with one of the regular reinforced concrete covers supplied by the Public Works Department, as soon as this had been done that cesspool being registered and added to the list for weekly oiling. Unfortunately owing to the shortage of cement it was not possible to get one tithe of the number of covers required but it is hoped that conditions will be easier in 1918. A teak cover was designed and a model made in the hopes of overcoming the difficulty caused by the cement shortage but the enhanced cost and difficulty of obtaining that also made teak covers impracticable.

The average number of cesspools under observation throughout the year was 118; of these the average number requiring to be oiled weekly was 94, the remaining 24 being dry on inspection. The total amount of the mixture of kerosine and crude oil used during the year was 521 gallons.

In the 'Ngambó portion of the town cesspools are comparatively uncommon. As a rule a trickle of dirty water from a hut points to the position of the kitchen or wash place. In many instances owing to the huts being separated from one another by about two feet only it would be impossible to dig cesspools but as far as possible they are being insisted on. Very considerable improvement has resulted in this neighbourhood from connecting the overflows from water hydrants to cesspools and it is hoped that in 1918 all hydrants will have been so dealt with. They have been found to work well where they have been placed and being fitted with man-holes can be inspected and oiled with ease. A great improvement on the trickling anopheline pool which previously was the invariable accompaniment of these 'Ngambo hydrants.

Sewage Disposal.—In the European quarters the commode system is in vogue. It is a very unsatisfactory method here and the design of the houses is quite unsuitable. In many, if not the majority, of the houses the "choo" adjoins the bedroom at the top of the house, in some cases it is on the roof—a preferable arrangement frequently—and the "choo boy" or sweeper has of necessity to carry his unsavoury burden right through the house, as often as not the bedroom, dining room, front or only stair and the front door being the line of his progress to the street. One of the few portions of the beach, where he is permitted to empty his pail, being the sweeper's objective he may have to traverse a considerable length of street before reaching it, to the offence of all the senses of passers by as from the design of the houses he is not able to perform his duties at times suitable to street traffic but must rather suit the time convenient to the householder. Only those of the lowest caste will undertake the work and men willing to do so are difficult to get hold of and are in consequence independent in their attitude, frequently irregular in their attendance and at the same time demand a high rate of pay.

In all other than European houses the privy pit system obtains. The storing up of large accumulations of excremental matter, often for years, in the basements of houses which are closely packed together cannot but have a detrimental effect on the health of the community but the only remedy is the installation of a water carriage system. Any attempt to extend the pail system is to be deprecated.

The installation of water closets draining to properly constructed cesspools would be quite feasible in the majority of European residences and has much to recommend it. Water for flushing could be obtained by pumping as is now done in those houses which are so fitted. These cesspools would of course be abolished when sewers are constructed.

In the 'Ngambo district many of the better class huts are provided with privies but a large propertion of the native population are content to resort to the beach of the Creek or to the bush.

Town Refuse. Collection and Disposal.—There are many and great difficulties in the way of maintaining the town lanes in a clean and sanitary condition. The chief difficulty is due to the dirty habits of the people who invariably deposit their refuse anywhere but in the place designed to receive it. The narrow lanes with their many turns and the usually bad and irregular surface, bounded by Indian shops on each side, will defy the best endeavours of the sanitarian who is still further hampered by the practice of dumping builders material, etc., by the side of the lane in which building operations are in progress. It is not possible to stop this practice entirely as there is nowhere else to dump these materials, at any rate temporarily, but unless a very close watch is kept the heap, if valueless, is not removed on the completion of the work and rapidly becomes a nuisance being an attractive place on which to deposit all sorts of filth.

At convenient places iron dust bins are provided. The type of bin in use consists of an iron cylinder 22″ in diameter and 30″ in height with a hinged lid with a flange round which is so made that it cannot be opened quite back unless, as frequently happens, sufficient force is used to bend the specially strengthened lid. These bins have been found to work more satisfactorily and to stand the wear and tear of use better than the old type of bin in which a spring was used to shut the lid. The bin stands on a concrete base which can be swept clean after the removal of the bin and its contents.

Wooden boxes are provided for the use of individual householders living at a distance from the nearest bin. These are not satisfactory but a sufficiency of iron receptacles is not available. These boxes are collected by the sweepers and emptied into the nearest bin together with the road sweepings, the bins being emptied into the cart which follows up on the sweepers.

During the year 43,933 hand cart loads of refuse were removed from the town—an average of 120 per day. There are three collections daily but even this is insufficient to prevent complaints which are usually due to putrid fish, etc., being deposited in the bin between the collections.

The greater portion of the town refuse is disposed of in the Destructor but owing to the absence of roads it is not possible so to deal with the greater part of the 'Ngambo refuse which has to be dumped in the most suitable places available. Small incinerators throughout this district would be an improvement and it is hoped that in the coming year it will be possible to get some erected. What is really urgently required in the 'Ngambo district are roads.

The destructor works fairly satisfactorily on the whole in the dry season but its position is singularly unfortunate. Under the most favourable conditions some nuisance is inevitable around a destructor and in the wet season when the destructor is unable to

deal with the wet refuse, which consequently accumulates, considerable nuisance results and flies abound in the adjoining markets. It is hoped that it will be possible before long to remove the destructor out of the town area altogether as recommended by Dr. Curwen.

Dairies and Cowsheds.—Early in the year all cowkeepers in the town were called upon to produce their licences under the Dairies Decree. None were able to do so. After personal inspection of each dairy the minimum sanitary requirements which have to be complied with before a licence could be recommended were pointed out to each owner and he was directed to carry out the necessary work without delay and to obtain a licence. With two exceptions the simple requirements specified were not complied with and after a considerable period of grace the various owners were prosecuted, and ordered by the Magistrate to comply forthwith or to vacate. The result of this prosecution was a petition from the cowkeepers for assistance from Government. They pointed out that being only monthly tenants of their sheds and having no security of tenure it was impossible for them to make any structural alterations to the premises they occupied. A scheme for housing all the dairy cattle in the town, some 200, in a central dairy to be erected on an approved plan by the Government and to be under the direct supervision and control of this Department was promulgated. The essence of the scheme was to have the dairy cattle housed under sanitary conditions and to have efficient control over the milk supply, the Government providing the accommodation, undertaking the maintenance of the dairy in a sanitary condition and supervising the process of milking and the maintenance of all milk vessels in a hygienic condition, the cowowners paying a suitable monthly sum per cow for these privileges and undertaking the feeding and management generally of their cows. This scheme was partially approved and a sum set aside in the estimates for 1918 for making a start as soon as a suitable site was selected. It is hoped that eventually the scheme will be carried out in full. The existing condition of the dairies and the milk supply of Zanzibar is deplorable and the central dairy under proper control appears to be the only means of getting any real improvement.

Markets.—The condition of the meat, fish and vegetable markets leaves much to be desired. More thorough supervision and the exercise of firmer control over stall-holders is essential, those who persistently keep their stalls and the implements used by them in a dirty condition being excluded from the privileges of the market. Proper meat hooks for hanging up meat should be provided for each stall it being the duty of the stall holder to keep all such hooks clean. A more liberal allowance of paint and whitewash must be insisted on in the markets which should be thoroughly cleaned and whitewashed every quarter. All stalls should be cleared at a reasonable time at the end of the day to enable the markets to be properly flushed and cleaned and the storing of produce in the market should be prohibited. The practice of allowing vegetables such as tomatoes,

lettuce, etc., to be deposited for sale on the road side—these things are frequently to be seen placed on a dirty piece of sacking by the side of the road gutter exposed for sale—should be discontinued. Raised benches should be provided for such produce and their sale elsewhere prohibited.

A more liberal estimate is required for repairs to the Public Markets in which cheap makeshift arrangements, such as old boxes or packing cases instead of proper benches, meat hooks suspended by odd pieces of old rope, etc., should not be tolerated.

Eating Houses.—There are a number of such places throughout the bazaar. They are not attractive places and are far from being hygienic. Every effort is made to secure their being kept in a cleanly condition but the structural unsuitability of the premises and the habits of the proprietors and their customers militate against any marked success. These eating houses, coffee shops, etc., should be licensed, the granting of a licence being conditional on the suitability of the premises and on the business being properly conducted.

Aerated Water Factories.—There are 7 Aerated Water Factories in the town. These are on the whole well conducted although in certain instances the premises are unsuitable. These places should be licensed. The type of bottle used is the self stopping variety in which a glass marble is forced by the gas against a rubber ring. It is an objectionable type of bottle as dirt is liable to collect on the top of the marble and to be precipitated into the contents when the marble is pressed down.

Burial Grounds.—There are 18 Public Burial Grounds belonging to the various religious communities in addition to the Government Burial Ground at Mwembeladu which was opened in 1914. All these burial grounds although situated within the town limits are in the outskirts of the town away from habitations. In the town proper—between the Creek and the sea—there are 14 private family burial grounds in which a limited number of interments may still be made. There are in addition in this area 66 private burial grounds which have now been closed and 34 more in the 'Ngambo district also closed As no buildings may be erected on the sites of any of these burial grounds they may be looked upon as valuable open spaces in the congested town.

During the year 366 persons were buried in the Government Burial Ground at Mwembeladu bringing the total number buried there up to 1474.

69 burials of paupers, etc., were carried out during the year, 50 were from the Government Native Hospital, 11 from the Infectious Diseases Hospital at Gulioni and 8 from ships in the harbour.

Town Planning and Improvement.—All plans for new buildings or for alterations to existing buildings are submitted to the Medical Officer of Health by the D. P. W. This arrangement has much to

recommend it. When viewing a site for a new building the absence of a definite town planning and improvement scheme is often keenly felt. The owner of the site wishing to make the most of it, irrespective of his neighbours, makes his plans accordingly and, in the absence of a definite plan of town improvement backed up by ample funds for compensation, there is nothing to stop him from erecting a building which it may be quite apparent will materially interfere with the future improvement of that particular area of the town.

Under the heading of town improvements the question of Offensive Trades may well be considered. The removal of the hide curing, lime burning and pottery baking industries from the town is a very desirable improvement which should not be difficult of execution. Steps should also be taken with regard to the manufacture of copra which should not be permitted in the town in low lying areas where efficient drainage of the waste from the cracked nuts is impossible. The smell arising from inferior copra stored in badly ventilated godowns in crowded parts of the town cannot but be injurious, it certainly cannot be conducive to the maintenance of robust health.

Mosquito Preventive Measures.—The measures which have been taken with regard to cesspools—the favourite breeding place of *Culex fatigans*, the mosquito which conveys Filariasis and Elephantiasis, have already been dealt with. These measures have undoubtedly caused a very marked diminution in mosquito pests in those areas of the town where it has been possible to deal with, at any rate, the greater number of the cesspools and if systematically carried out will in time rid the town of *Culex fatigans*, provided that the routine inspection of premises to which reference has been made is also carried out systematically and thoroughly. The results of these inspections are shewn in the accompanying Table II. It will be seen from this table that by far the most frequent finds have been of *Stegomyia fasciata*. This is to be explained by the preference this mosquito has for clean water which is to be found stored in almost every house in various receptacles in which if present the larvae are easily found. This mosquito is also the usual one to be found breeding in the odd collections of water in old tins, etc., carelessly thrown out. The fall in the number of Stegomyia finds as the year progressed is probably to be explained by householders finding it advantageous to adopt the advice given and to have their "mitungi", etc., empty and turned upside down ready for inspection in that position by the inspector when he makes his weekly visit. A complete emptying and drying once a week of these water vessels ensures that even if eggs are laid in them during the week no adult mosquitoes will have time to hatch out. The casual emptying of a water vessel will not ensure this as invariably a little water remains behind in which any larvæ which may be present can survive until the vessel is refilled.

During the year 616 notices were served intimating the existence of mosquito breeding places. There were 6 prosecutions. Under the Decree there is no case for prosecution unless mosquitoes are found breeding a second time on the premises within 21 days of the service of a notice. This time limit is far too short as the usual result of a notice is activity on the part of the householder in hunting out possible breeding places on his premises but this activity in many cases lasts no longer than a week or two unfortunately and then lapses occur. As prosecutions, even those resulting in a purely nominal fine, are undoubtedly of great educational value it is regrettable the law has not been amended.

Mosquitoes were on a few occasions found breeding in house gutterings as is shewn in the table. The small number of finds is due to the difficulty and frequently impossibility of inspecting the gutterings which are undoubtedly responsible for a great deal more than they are credited with in the table. As they are invariably defective and do more harm to the road surface than none at all, and are usually to be classed as nuisances from the accumulation of filth which they contain, every opportunity is seized for getting them completely removed but it is much to be regretted that under the new Building Regulations the placing of gutterings is still insisted on unless with the consent of the Building Surveyor special exemption is granted. Apart from the fact that the breeding out of mosquitoes actually does occur in these places it has to be remembered that the eggs of the Stegomyia deposited in a small collection of water in a gutter which may soon become dried up by the sun are not destroyed by prolonged drying and will on being washed into a receptacle by the next rain breed out.

Zanzibar has so far been fortunate in never having experienced an outbreak of Yellow Fever which is carried by *Stegomyia fasciata* and the importance of measures for eliminatiug this mosquito is apt to be overshadowed by the more immediately apparent need for dealing with *Culex fatigans*, the carrier of Filariasis, and Anopheles, the carrier of Malaria, both of which diseases are endemic. The possibility of Yellow Fever being introduced here where all the conditions are favourable cannot be overlooked, the natives of countries where this disease is endemic being credited with being reservoirs of the germs which cause the disease, and the elimination of the Stegomyia should be energetically aimed at. It has to be remembered that where Filariasis and Malaria cause disability and invaliding and comparatively rarely death, Yellow Fever usually ends in death. It must also be borne in mind that with the large movements of natives caused by the War many natives from Yellow Fever countries are likely to be passing through Zanzibar; during the year under review a large number of such natives actually have been here for short periods.

Dr. Aders in his Report on Economic Biology refers to the use of wooden tubs cut down to about 6″ in depth, containing water with

a little mud at the bottom and a little grass, etc., and simulating a fairly typical anopheline breeding pool, as indicators of the presence of anopheles in a given neighbourhood. Weekly observations of the indicators, placed at stated points round the periphery of the town and in the town, have been most instructive and demonstrate the arrival of anopheles into the town from the out-lying permanent breeding places, following closely on the beginning of the rains, and their gradual disappearance after the rains as the temporary breeding places in the town dry up. They have also been of great practical assistance in indicating a breakdown in the systematic routine inspection which would otherwise possibly have been overlooked.

The behaviour of one of these indicators placed in an out-lying part of the 'Ngambo district near the so called Simba Mosque pits, a notorious anopheline area, is of some interest. The pits referred to are two large depressions or ponds which except at the end of a prolonged period of dry weather contained water heavily infected with anopheles. The sides of the pits were uneven and heavily bushed. When the indicator was first placed in position the pits were dry and had been for some little time but the indicator was invariably infected until the bush was cleared when it became at once negative and remained so until the pits were filled after rain. On first placing this indicator there were no anopheline pools anywhere in the vicinity, it was at the end of a long period of dry weather, and it would seem that the infection was due to anopheles held up in the bush.

The result of the measures taken to deal with this area are of some interest. On making a survey it was found that the water in the pits was of the same level as that in adjoining wells. They were in fact enlarged and irregular wells and not simple ponds containing surface water. It was therefore considered that by filling in the pit partially—to fill completely would have been a costly measure—considerable improvement might be expected. The pits were filled to the extent of between 4 and 5 feet with the most satisfactory results and it is now only after a heavy downpour that any water appears in them and this rarely remains more than one or at most two weeks. The observations of the anopheline indicator show that what was previously a notorious area now compares very favourably with any other area in this part of the town. This improvement must also be partially attributed to the collecting in cesspools in the neighbourhood of the waste water from water hydrants already referred to.

During the year a considerable amount of bush clearing and tree felling was undertaken in the area between the Mnazi Moja Sports Club and the Kilimani Gaol with satisfactory results.

The Migombani swamp drainage was completed towards the end of the year and will undoubtedly greatly improve this area.

New drainage works were started in the Gulioni area but had not been completed by the end of the year.

Further levelling of the Polo ground was completed.

These latter works connected with swamp drainage have been carried out by the Public Works Department.

DISTRICT SANITATION—ZANZIBAR.

MKOKOTONI DISTRICT.

The station at Mkokotoni has a bad reputation for Malaria and throughout the year Anopheles mosquitoes in greater or lesser numbers may be found. Breeding places have been found even in the dry season in a stream at the back of the Gaol and during the rains in a smaller temporary stream between the latter and the Gaol and in the low-lying land behind the Clerks' Quarters.

Extensive drainage works would be necessary here to eliminate Anopheles and a larger expenditure than the present importance of the station would seem to justify. Considerable improvement has resulted from clearing thick bush and felling a number of large mango trees which was carried out during the year.

CHWAKA.

The chief importance at present of the station at Chwaka, which during the year has been administered from town, is as a health resort where a large number of officials and others spend their short leave. An inspection of the various bungalows made in April as the result of complaints as to the prevelance of mosquitoes revealed a considerable number of adult anopheles in certain of the houses which were in occupation and several breeding places of Culex and Stegomyia. The actual breeding places of the anopheles were not determined owing to the dense bush extending right up to the houses and making an inspection impossible. A general clean up of the station and the adjoining town was at once undertaken and the bush was cleared back for some 50 yards. The results were satisfactory and there have been no further complaints.

MWERA.

This station is also administered from the town. It has a notoriously evil malaria reputation, the river which meanders through the district between irregular banks merging into swamps being heavily infested with anopheles. Extensive anti-malarial measures will be necessary here before any improvement can be expected.

BUBUBU.

This small township consists principally of a row of small shops on each side of the main road with a market of some importance. The staff here consists of three sweepers under the supervision of the sergeant of police and weekly visits from one of the town inspectors. Here as elsewhere the Indian shopkeeper soon manages to collect round him all sorts of filth and rubbish unless checked. He might well take lessons in cleanliness from his humbler and less educated Swahili neighbour.

TABLE II.

Breeding Places of Various Kinds of Mosquitoes found in Zanzibar Town during 1917.

Months	Iron drums and Cisterns			Wooden barrels			Earthern pots Mitungi etc.			Cemented Tanks and Wells			Drains, Cesspools, etc.			Holes in trees, old tins etc.			Boats and Dhows			Gutterings to houses			Swamps and other places			Total			Rain fall
1917	S	C	A	S	C	A	S	C	A	S	C	A	S	C	A	S	C	A	S	C	A	S	C	A	S	C	A	S	C	A	
January ..	43	2	0	12	5	0	30	1	0	7	4	0	7	9	0	7	3	0	1	1	0	4	0	0	1	1	0	112	26	0	2·20
February ..	27	2	0	10	0	0	10	0	0	4	2	0	0	7	0	8	4	0	1	2	0	1	0	0	0	0	0	61	17	0	4·29
March ..	41	1	0	6	0	0	14	0	0	3	1	0	1	7	1	6	2	0	0	1	0	1	0	0	0	0	0	72	12	1	4·46
April ..	20	1	0	7	0	0	3	0	0	2	0	0	0	4	1	6	6	2	1	1	0	0	0	0	0	0	0	39	12	3	16·49
May ..	13	0	0	8	1	0	5	1	0	3	2	0	0	4	0	4	2	2	0	0	0	0	0	0	0	0	0	33	10	2	10·63
June ..	14	1	0	3	0	0	0	0	0	1	1	0	0	4	0	0	0	0	0	0	0	0	0	0	0	6	6	18	12	6	4·20
July ..	5	0	0	2	0	0	2	0	0	2	1	0	0	4	0	3	0	0	1	3	0	0	0	0	0	0	0	15	8	0	1·23
August ..	26	2	0	13	3	0	5	0	0	4	0	0	1	1	0	1	3	0	0	2	0	0	0	0	0	0	0	50	11	0	2·05
September ..	25	1	0	8	0	0	14	0	0	4	0	0	2	2	0	6	1	0	0	0	0	0	0	0	0	0	0	59	4	0	2·01
October ..	32	0	0	3	2	0	5	2	0	2	0	0	1	6	0	5	0	0	0	1	0	0	0	0	0	0	0	48	11	0	2·27
November ..	39	2	0	8	1	0	12	0	0	7	0	0	1	4	0	7	0	0	0	0	0	0	0	0	0	0	0	74	7	0	6·79
December ..	14	0	0	2	1	0	7	0	0	3	0	0	0	1	0	3	0	0	0	0	0	1	0	0	0	0	0	30	2	0	0·44
Total ..	299	12	0	82	13	0	107	4	0	42	11	0	13	53	2	56	21	4	4	11	0	7	0	0	1	7	6	611	132	12	57·06

PEMBA SANITATION.

The staff at Pemba consists of one Head Inspector with two Sub-Inspectors, three Overseers, two Headmen and 24 Sweepers. These are under the immediate control of the Medical Officer who acts as Assistant Medical Officer of Health.

The Medical Officer and the Head Inspector have their head-quarters at Chake Chake, visiting the stations at Weti and Mkoani periodically. The Head Inspector in addition to his more purely sanitary work looks after the food supplies, etc., of the Lepers who are in the settlements at Nduni near Weti, Pugini near Chake Chake, and Kengeja near Mkoani.

Water Supply.—The water supply of Chake Chake is obtained from a spring at the bottom of the hill on which the town is built, the water being collected in a reservoir from which it is pumped to a supply tank on the hill top. From its position the spring is liable to possible pollution from cesspools and privy pits in the town and for drinking purposes until a long series of analyses have proved the purity of the water it must be viewed with some suspicion. Boiling and filtering would most certainly be advisable.

The water supply of Weti is also from a spring the position of which is however not open to the same objections as that at Chake Chake. The water here is pumped to a supply tank.

Rain water collected in tanks supplies Mkoani where there are also a few wells which are bad.

Drainage.—Cement surface drains exist at Chake Chake and Weti. The difficulty, especially at Chake Chake, is that these drains when they end at the edge of the precipitous hill side cause erosion and the formation of large anopheline holes at the bottom of the valley and if continued down the hill-side the soil under breaks away and the drain itself becomes broken and useless. Pipe drains would seem to be the only solution of the difficulty.

Cesspools.—These do not work well in any part of Pemba owing to the non-porous nature of the soil which is largely of clay.

Sewage Disposal.—As in Zanzibar the Europeans adopt the pail system, the Indians, etc., have privy pits, and the natives resort to the beach or the bush.

Scavenging.—Dust bins are distributed through the town, the refuse from these with the street sweepings being collected daily and carted to rubbish dumps where it is burned periodically. It would be well to have small incinerators at suitable places in Chake Chake and Weti.

Dairies and Milk Supply.—The Medical Officer remarks that during the year 43 licenses under the Dairies Decree were issued. Most of the cows are kept outside of the townships and supervision and control of the milk supply is consequently difficult. He states

that on the whole the milk is generally of good quality and adulteration uncommon. As the boiling of milk is a universal practice the risk of the milk carrying disease in minimised.

Public Markets.—There is a market at Chake Chake, at Weti, at Mkoani and at Jambangombe. Constant supervision is very necessary to keep these places in a cleanly condition and similar measures to those advocated with regard to the market in Zanzibar, as regards repairs, whitewashing, provision of stalls for such vegetables and fruit as may be eaten raw, and control over the stall-holders apply here as elsewhere.

Slaughter Houses and Meat Inspection.—There is a Slaughter House at Chake Chake and one at Weti. The number of animals slaughtered in these were as follows:—

Bullocks	...	Chake Chake	111	Weti	73
Goats and Sheep	...	,,	,,	112	,,	88

The Medical Officer states that the meat is generally of good quality and that it is rare to find diseased meat.

Aerated Water Factories.—There is one of these at Chake Chake and one at Weti. These place should be licensed and boiled water used more especially at Chake Chake for reasons already referred to.

Anti-Mosquito Measures.—The Medical Officer remarks that the whole of Pemba is infested with Malaria, the type observed as a rule being mild and such parasites as have been found being of the sub-tertian variety.

House to house inspections, bush clearing and the prophylactic issue of quinine are the chief anti-malaria measures adopted. The grading and draining of the valleys immediately in the vicinity of the stations are measures which should be pushed. A certain amount of oiling of these places is carried out. Dr. Dunderdale, Medical Officer, considers that the growing of rice, bananas, sugar cane, etc., close to townships should be prohibited but is doubful if this could be enforced. The cultivators should most certainly be made to so arrange the ditches between their crops when earthing them up, more especially in the case of muhogo (cassava), in such a way that water does not stand in them. These ditches are a prolific source of anopheles.

Dr. Dunderdale considers that Filariasis is very common. In 30 blood smears examined by him he found microfilaria nocturxna present in 12. These figures are of course too small to be of any statistical value but are very similar to those obtained on a larger scale in Zanzibar by Dr. Howard of the Universities Mission.

During the year a considerable amount of bush clearing was undertaken chiefly at Chake Chake. The amount spent on this service in Pemba was Rs. 1,229 but as Dr. Dunderdale remarks not nearly enough was done and a much larger expenditure is necessary on this

most important work which as he points out would be more economically and efficiently done by the employment of a special bush clearing gang rather than by casual labour. A certain amount of assistance in bush clearing was given by prisoners.

Food Inspection.—150 bags of rice and other grain were examined and condemned as unfit for human consumption.

PART II.—PREVALENCE OF CERTAIN DISEASES.

It is satisfactory to note that no serious epidemic occurred during the year. This is specially gratifying as Plague, Small-Pox, Cerebro-spinal Meningitis and other diseases were prevalent on the neighbouring mainland, the number of cases notified by the Principal Medical Officer for British East Africa being Plague 332 cases, Small-Pox 1287 cases, Cerebro-spinal Meningitis 647 cases and by the Medical General Headquarters at Dar-es-Salaam, Plague 131 cases, Small-Pox 714 cases, Cerebro-spinal Meningitis 2372, Chicken Pox 1705 and Mumps 814 cases. Plague and Small-Pox were constantly present in Bombay, Porbunder and other Indian ports in direct communication with Zanzibar. Plague was present in Aden, 126 cases being notified, also in Suez and in Cape Colony.

The number of cases of Infectious Disease notified in this Protectorate is shewn in the accompanying Table III.

Cerebro-Spinal Meningitis.—23 cases of this disease came under observation. These were distributed as follows:—

15 cases occurred among K. A. R. recruits who had recently arrived from the mainland. Of these 4 died in the K. A. R. lines at Ziwani, 2 died in the Native Hospital having been removed there before the disease was diagnosed or on account of some other disease, 1 case died at the Quarantine Station, and 6 cases died at Gulioni in which institution 2 cases remained at the end of the year.

3 cases occurred on the French Troopship "Nera" from Madagascar. 1 of these died on the ship on her arrival in the port, the body being immediately removed ashore for burial. The other 2 cases were removed to the Infectious Diseases Hospital and died there. It is of interest to note that it was learnt on this steamer's return that no further case of this disease developed during the voyage to Marseilles although she was extremely crowded with native troops.

TABLE III.

INFECTIOUS DISEASES NOTIFIED DURING 1917.

	Zanzibar.				Pemba	Total	Deaths	Remarks.
	Ships	Quarantine	Ziwani	Town				
Cerebro-spinal Meningitis ..	3	2	13	3	2	23	21	1 death at Prison Island. 2 deaths in Native Hospital from Ziwani. 4 deaths K.A.R. lines, Ziwani. 2 deaths Weti, Pemba, 1 death on ship in harbour- 11 deaths at Gulioni Hospital.
Chicken pox ..	25	..	12	9	..	46	..	
Measles ..	11	..	..	9	..	20	..	
Mumps ..	2	..	..	..	..	2	..	
Small pox ..	7	..	..	..	..	7	2	all cases treated at Gulioni.
Total ..	48	2	25	21	2	98	23	

2 cases, both fatal, were reported from Weti, Pemba. Both were contacts of a discharged porter who had recently returned from G. E. A. This man, who was evidently a carrier, did not develop the disease.

3 cases occurred in Zanzibar Town. One had recently returned home from G. E. A. via Nairobi where the disease was known to be prevalent. The history obtained in one case pointed to the possibility of his being a contact of the Weti cases but in neither this nor in the third case was the source of infection definitely determined.

With regard to the outbreak among the K. A. R. recruits, which at one time looked like developing into a serious epidemic, it was not until the third death had occurred that suspicions, which were confirmed by finding the meningococcus in the cerebro-spinal fluid, were aroused as to the true nature of the cases. On the 4th of May a recruit, who had recently arrived from Mafia via Dar-es-Salaam, died with cerebral symptoms which were ascribed to Malaria and the death so certified. On the 6th of May another recruit of the same batch died with somewhat similar symptoms and the death was ascribed to Malaria. On the morning of the 8th of May a third recruit of the same batch who had been taken ill the previous evening and admitted to the Native Hospital died there. Suspicions were then aroused as to the true nature of this and the preceding two cases, a post-mortem examination revealed a condition of basal meningitis and later the meningococcus was found in large numbers in the cerebro-spinal fluid. Another case presenting symptoms of Cerebro-spinal meningitis had in the meantime been admitted to the Native Hospital from Ziwani. He was immediately removed to the Infectious Diseases Hospital and the 45 remaining recruits of the same batch were also segregated there as contacts. Among these contacts 5 further cases developed. These cases all died. One of the contacts was

found on admission to the Infectious Diseases Hospital to be suffering from purulent ophthalmia and was removed to the Native Hospital and segregated there. He remained free of any symptoms for nearly a month but suddenly these developed and he died on the 7th of July. Two further cases, evidently contacts at Ziwani of the first series, developed in the K. A. R. lines. They both died on the 6th and 19th July respectively. No further cases occurred among the recruits until the arrival of a batch from Dar-es-Salaam on the 4th December. This batch were placed at the Quarantine Station as several were suffering from Chicken Pox. On the 6th of December one of these men died at the station within less than three hours of the appearance of the first symptoms which were undoubtedly those of Cerebro-spinal meningitis. Two further cases developed in this batch. They were removed to the Infectious Diseases Hospital where they remained at the end of the year.

Chicken Pox.—46 cases of this disease came under observation. 25 were removed from ships in harbour. 12 occurred among K.A.R. recruits from the mainland. 3 were sent from the Native Hospital and 2 from the Naval Barracks. 4 occurred in the Gaol.

All with the exception of those in the Gaol were treated at the Infectious Diseases Hospital. This disease is not "notifiable" and it is possible that other cases escaped observation. It would be well that this disease be added to the compulsorily notifiable diseases. In the native it is a comparatively severe illness, it is highly contagious, and in the natives especially it might easily be mistaken at any rate at first for Small Pox.

Measles.—20 cases came under observation. This is not a notifiable disease and it is hardly necessary that it should be included in the list. It is in the tropics a mild disease and being infective in the early stages before a diagnosis has been arrived at very often little good is likely to result from notification.

Mumps.—2 cases of Mumps came under observation. Both were removed to the Infectious Diseases Hospital from troopships.

The possibility of Plague being mistaken for Mumps has to be born in mind. It is of interest to note that one of the cases was removed from H. M. T. "Barjora" on her way through to Dar-es-Salaam with troops from Nairobi where Plague was at the time prevalent. All was well on the ship when the case of Mumps was removed but on the following day 7 cases of Pneumonic Plague were discovered on her arrival at Dar-es-Salaam where a considerable outbreak followed at the Quarantine Station.

Small Pox.—7 cases of this disease occurred. 5 of these were removed from ships arriving from Bombay. The remaining two cases developed the disease in the Infectious Diseases Hospital. Both were the immediate contacts of the children of a woman who had been removed with confluent Small Pox and died the day after admission.

One of these children died. She developed the disease 12 days after possible exposure to infection. Both children had been vaccinated in Bombay before sailing but shewed no marks. They were again vaccinated on arrival here but did not take owing to the poor quality of lymph then available which was giving very poor results.

Plague.—No case of plague occurred in the Protectorate during the year. The systematic collection and examination of rats was carried on as in past years. No case of plague was discovered among rats.

Dysentery.—21 deaths were certified as being due to this disease. Five gave a history of having recently arrived from the mainland where it is probable the disease was contracted.

Malaria.—It is an accepted fact that this disease is endemic throughout the Protectorate. In Zanzibar Town it is probable that malaria is seldom contracted at any rate during the drier seasons of the year but in Pemba and the shamba districts of both islands the position is quite different. There are unfortunately no records which would give any reliable indication of the prevalence of the disease available at present, the figures given in the accompanying Table IV —the results of blood examinations for Malaria—hardly being representative of the whole population although of considerable interest. The parasite generally found in cases contracted in the Protectorate is the sub-tertian or malignant tertian variety.

Of 272 blood films examined for parasites during the year in the Bacteriological Laboratory 104 were found to be positive. The majority of the specimens were received from the European Hospital, the Naval Barracks, etc., and from Europeans serving with the Navy or Army who had undoubtedly contracted the disease elsewhere than in the Protectorate.

Sub-Tertian parasites were found in 69 cases. Of these cases in 12 the disease was probably contracted in Zanzibar, as far as could be ascertained the place of origin being as follows—Zanzibar Town, 5 cases; Chukwani Naval Air Service Barracks 2 cases; Migombani 2 cases; Walezo Asylum 1 case; Mkokotoni 2 cases.

In the remaining 57 cases as far as could be ascertained the disease had been contracted elsewhere.

Benign Tertian Parasites were found in 35 cases. All of these cases were members of the Rufigi River Transport who were stationed here for a short time on their return from the Rufigi River where the disease had probably been contracted. No case of Benign Tertian Malaria was as far as known contracted in Zanzibar. One film showed a mixed infection of Benign and Sub-tertian parasites.

31 deaths were certified as due to Malaria.

TABLE IV.

RESULT OF BLOOD EXAMINATIONS FOR MALARIA 1917.

Month	Examinations	Positive cases.				Remarks.
		Sub-Tertian		Benign Tertian		
		Zanzi-bar	Else-where	Zanzi-bar	Else-where	
January ...	21	4 (1)	6	...	...	(1) Chukwani 2. Migombani 2.
February ...	33	...	8	...	...	
March ...	22	...	2	...	...	
April ...	22	...	7	...	..	
May ...	47	2 (2)	19	...	...	(2) Ngambo 1. Town proper 2.
June ...	22	3 (3)	3	...	1 (4)	(3) Ngambo 1. Town proper 2. (4) Mixed infection with Sub-tertian.
July ...	19	...	5	...	11 (5)	(5) Rufiji River Transport.
August ...	24	1 (6)	4	...	10 (5)	(6) Walezo.
September ...	20	1 (7)	...	...	10 (5)	(7) Mkokotoni.
October ...	8	...	...	...	1	
November ...	24	1 (1)	3	.	1	(8) Mkokotoni.
December ...	10	...	...	...	1	
	272	12	57	...	35	

Blackwater Fever.—4 deaths from this disease were so certified. Of these 3 had recently arrived from the mainland. The Medical Officer, Pemba, reports the occurrence of 6 cases with one death at Pemba.

Tuberculosis.—41 deaths were so certified. Three of these occurred on ships in harbour.

Tetanus.—The Medical Officer of Pemba reports the occurrence there of two cases of tetanus both of which were fatal.

In Table V the nationality of the deceased, the place where death occurred and the probable place of infection is shewn as regards the deaths registered in Zanzibar from the diseases dealt with above.

TABLE V.

Analysis of Deaths from Certain Infective Diseases. 1917.

Disease		Nationality		Where death occurred		Probable place of infection	
Cerebro-spinal Meningitis	19	Swahili	13	Gulioni Hospital	11	K.A.R. Recruits	13
		Madagascarene	3	Native Hospital	2	Madagascar	3
		Arab	1	Ziwani K.A.R.	4	Nairobi	1
		Murfigi	2	Port	1		
				Prison Island	1		
Dysentery	21	Ismaili Khoja	8	C. district	5	G. E. A.	5
		Swahili	5	D. ,,	4		
		Arab	2	Native Hospital	4		
		Hindoo	2	B. district	5		
		British	1	Eur. Hospital	1		
		Kikuyu	1	K.A.R. lines	1		
		Ithnasheri Khoja	1	Port	1		
		Seychellian	1				
Malaria, Acute and Chronic	31	Ismaili Khoja	8	B. district	12	G. E. A.	3
		Ithnasheri Khoja	8	C. ,,	6	ss. Taroba	1
		Swahili	4	D. ,,	5		
		Arab	4	Native Hospital	3		
		Bohora	2	Ziwani K.A.R.	2		
		Hindoo	2	Chwaka District	1		
		Memon	2	A. district	1		
		Mussulman	1				
Blackwater Fever	4	Cingalese	1	A. district	1	Dar-es-Salaam	3
		Ismaili Khoja	1	B. ,,	1		
		Ithnasheri Khoja	1	D. ,,	1		
		Mussulman	1	Native Hospital	1		
Small Pox	2	Memon	1	Gulioni Hospital	2	Bombay	2
		Dutch S. African	1				
Tuberculosis	41	Ismaili Khoja	10	B. district	23	Kismayu	1
		Ithnasheri Khoja	7	D. ,,	6	ss. Nera	1
		Hindoo	7	C. ,,	3	ss. Karoa	1
		Arab	3	A. ,,	2	ss. City of Sparta	1
		Goan	3	Native Hospital	2		
		Swahili	3	Port	3		
		Bohora	2	Gulioni Hospital	1		
		Memon	2	Prison Island	1		
		Madagascarene	1				
		Mnyamwezi	1				
		Kikuyu	1				
		Pathan	1				

Ankylostomiasis.—The ova of Ankylostoma duodenale were found in 360 out of 563 specimens of faeces examined during the year in the Bacteriological laboratory. Unfortunately no distinction was made between new cases and re-examinations of cases under treatment and these figures are therefore practically useless as an indication of the

prevalence or otherwise of this disease. More complete records are now being kept, fuller information being supplied by the medical man sending stools for examination and it is hoped that by the end of 1918 it will be possible to furnish reliable statistics.

Dr. Robert Howard of the Universities Mission has been kind enough to furnish the following figures of examinations of stools by him at the Mission Hospital and elsewhere.

Examinations of Stools at Mbweni, 1911 to 1914.

Total number of examinations	...	147	
Ankylostome ova present	...	134	
Percentage infected	...	...	91%

Dr. Howard remarks that Mbweni is a typical shamba village and believes that this high percentage would hold good throughout the shambas.

Analysis of cases of Ankylostomiasis treated at Mkunazini Mission Hospital during 1916.

Number of patients examined	...	365	
,, found infected	...	319	
Percentage infected	...	...	87·5%
Cured after 3 treatments	...	30	24·0%
,, ,, 6 ,,	...	92	74·0%
,, ,, 9 ,,	...	117	94·0%
,, ,, 12 ,,	...	122	98·4%
Not cured out of 124 cases treated	...	2	1·6%

Analysis of cases of Ankylostomiasis treated at Mkunazini Mission Hospital during 1917.

Number of patients examined	...	365	
,, found infected	...	306	
Percentage infected	...	...	84·0%
Cured after 3 treatments	...	95	39·0%
,, ,, 6 ,,	...	208	81·0%
,, ,, 9 ,,	...	233	96·0%
,, ,, 12 ,,	...	239	98·8%
Not cured out of 242 cases treated	...	3	1·2%

The treatment adopted by Dr. Howard consisted of 80 grains of Thymol or Beta-naphthol given each day on three successive days. After four clear days if on examination ova were still present this dose was repeated and so on until the case was cured or treatment abandoned.

During the year 22 deaths were certified as being due to Ankylostomiasis.

Leprosy.—During the year 38 fresh cases of Leprosy were discovered and placed in one or other of the Leper settlements.

At the beginning of the year there were 286 Lepers known and under more or less control in the settlements.

The total number coming under observation during the year including the new cases was 324, of these 41 died and three escaped and were not recovered, 280 remaining in the settlements at the close of the year.

Details as to the distribution of the Lepers in the Protectorate are furnished in Table VI.

The unsuitability of the existing arrangements for the segregation of Lepers in this Protectorate can hardly be exaggerated. As will be seen by the Table the greater number of Lepers are in the settlements at Pemba which by their extreme inaccessibility make all attempts at proper control and management, quite apart from medical treatment, absolutely impossible. The conditions at Walezo Asylum in Zanzibar are only a shade better. Here even there is little or no control and it is nothing unusual to find that certain of the Lepers have gone off to visit their friends or to work on their shambas. The treatment at Walezo is of the most elementary kind only.

The concentration of all the Lepers in the Protectorate in one settlement has been proposed and the island of Funzi near Weti has been suggested as a suitable place for the purpose. The adequacy of the water supply on this island remains to be proved but it is to be hoped that means will be found for augmenting the existing supply from two wells if necessary by arranging for the storage and collection of a rain water supply and that this scheme will soon be an accomplished fact.

Filariasis.—No systematic investigation into the prevalence of this disease was made during the year. Dr. Dunderdale found 12 persons harbouring Microfilaria out of 30 examined at Pemba. Dr. Aders found 6 persons infected out of 15 examined by him in Zanzibar.

TABLE VI.

LEPERS. Zanzibar and Pemba, 1917.

Locality	Remaining on Dec. 31, 1916	Admitted	Total	Died	Discharged	Escaped	Remaining on Dec. 31, 1917	Monthly Average.
ZANZIBAR—Walezo.								
Males ...	47	10	57	14	...	1	42	45
Females ...	60	5	65	3	...	2	60	60
Total...	107	15	122	17	...	3	102	105
PEMBA.								
Nduni ...	60	3	63	8	...	...	55	55
Pujini ..	80	18	98	11	...	...	87	82
Kengeja ...	39	2	41	5	...	...	36	36
Total...	179	23	202	24	...	...	178	173
	286	38	324	41	...	3	280	278

PART III.—PREVENTION OF INFECTIOUS DISEASE.

PORT HEALTH SERVICE.

An analysis of the work undertaken during the year under the heading of Port Sanitation is given in Table VII.

The importance of this service can hardly be overestimated when dealing with a port such as this which on one side is in direct communication with many ports which are constantly infected with Plague or Small Pox such as Bombay and on the other is the port of entrance to a crowded town where the difficulties of dealing with an epidemic of either of these diseases are very considerable. The large numbers of immigrants, many of them of a most undesirable type, brought from India and elsewhere by the British Steam Navigation Company's steamers and also by dhows during the N. E. monsoon, must always cause some anxiety as to possible introduction of disease into the town and thence spreading throughout the Protectorate. The possibility of infected rats being imported with the rice and other grain which forms a large part of the cargoes of these vessels has also to be borne in mind.

During the year under review the presence of Plague and Small Pox in Mombasa and other neighbouring ports, the large movements of native troops and porters, and the frequent non-observance of the usual peace time practices of ships entering a port in flying signals until admitted to pratique did not tend to decrease the anxieties. On one occasion a troopship crowded with sick porters, arrived at 6 a.m. three died while in port, and several more before her arrival at Kilindini the following day and some 27 of the sick porters were allowed to land immediately. The first intimation received by the Health Officer was at 10 a. m. when he was requested by the Military authorities to assist with the disposal of the sick men for whom there was not sufficient accomodation on the ship. The request could not most unfortunately be complied with as all available accomodation was at the time fully occupied.

TABLE VII.

PORT SANITATION RETURN, 1917.

	Arrivals			Restricted ships	Ships Claytonised	Passengers landed	Passengers under Surveillance	Persons Vaccinated	Persons placed in Quarantine	Remarks.
	British	Foreign	Total							
Steamers—										
January ..	15	2	17	..	..	524	197	97	82	
February ..	12	..	12	..	..	455	224	54	..	
March ..	11	3	14	..	..	472	65	76	..	
April ..	6	1	7	..	..	242	19	10	..	
May ..	26	2	28	4	6	784	289	1297	1335	
June ..	35	1	36	6	5	541	238	319	276	
July ..	24	3	27	..	3	621	191	28	262	
August ..	21	1	22	6	5	843	228	39	..	
September ..	22	3	25	7	3	310	262	35	48	
October ..	31	3	34	2	2	398	172	..	..	
November ..	24	..	24	4	6	561	184	166	..	
December ..	36	3	39	..	3	416	157	124	76	
Total ..	263	22	285	29	33	6167	2226	2245	2079	
Dhows—										
January ..	91	19	110	..	..	297	..	341	..	
February ..	83	58	141	..	..	411	7	304	..	
March ..	125	89	214	..	..	751	18	390	..	
April ..	88	19	107	..	..	180	..	208*	..	* includes crews.
May ..	85	18	103	..	..	317	..	63	..	
June ..	87	29	116	..	..	277	..	100	..	
July ..	66	28	94	..	..	173	..	250	..	
August ..	88	20	108	..	..	468	..	203	..	
September ..	93	38	131	..	..	276	..	291	..	
October ..	104	34	138	..	..	430	..	244	..	
November ..	114	28	142	..	..	313	6	113	..	
December ..	107	46	153	..	1	240	16	95	..	
Total ..	1131	426	1557	..	1	4133	47	2602	..	

TABLE VIII.

	Steamers.			Dhows.			Total No. passengers examined	Total No. placed in Quarantine
	Total No.	Restricted	No. passengers examined	Total No.	Restricted	No. passengers examined		
1913	347	2	7,055	168	10	940	7,995	944
1914	318	28	5,009	199	19	3,228	8,237	2,174
1915	199	4	4,706	64	...	261	4,967	...
1916	177	4	6,390	281	...	1,128	7,518	2,196
1917	285	29	6,167	1,131	...	4,133	10,300	2,079

During the outbreak of plague in Mombasa, the first intimation of which was the reported finding of infected rats in the Customs, all steamers which had worked cargo in that port were fumigated with the Clayton Gas Machine before being permitted to discharge here. The process, although admittedly not very satisfactory in the case of a vessel full of cargo, led to the destruction of a considerable number of rats in the ships treated and was certainly a safeguard. The amount of gas used was calculated at the rate of 31 lbs. of roll sulphur completely burnt in the machine for every 1000 cubic feet of space in the hold when empty. In no instance was any complaint received on account of damage to cargo having resulted.

The large increase in the number of dhows admitted to pratique during 1917 as compared with previous years was due to the fact that through the year all dhows from abroad were boarded on arrival and admitted to pratique whereas in past years only dhows arriving in the season of the N. E. monsoon from India and the Persian Gulf were treated.

Throughout the year as far as was possible all natives who did not shew evidences of small pox or good vaccination marks were vaccinated on arrival whether by steamer or dhow before being allowed to land.

All native passengers from Mombasa during the existence of plague there were inoculated unless they had a recent inoculation certificate and placed under medical surveillance for a few days.

Comparison with previous years is shewn in Table VIII.

QUARANTINE STATION.

From Table IX it will be seen that the total number of persons placed at the Quarantine Station amounted to 2157, the largest number at the station at any one time being 1254. This large number occurred in the case of the quarantining of the s.s. "Karoa" which arrived from Bombay with four cases of Small Pox on board. The housing and feeding of this large number of persons, deck passengers

of every caste, brought into prominence the many deficiencies which were the subject of a special report at the time. The length of time this quarantine lasted, from 7th May to 2nd June, was due to the passengers having to wait over for another ship, the Karoa having gone on without them, many of them being for southern ports.

The station was occupied for 116 days.

The numbers of cases treated at the Quarantine Station are shewn in Table X. These cases were chiefly minor ailments, all of a more serious nature being if possible transferred to the Infectious Diseases Hospital where better facilities for treatment existed. Two cases of Cerebro-spinal Meningitis occurred. One of these died within a few hours of being taken ill. The second was removed to the Infectious Diseases Hospital as were also five cases of Measles. These Measles cases occurred among the passengers of s.s. "Karoa" being discovered at the last moment as the passengers were being examined before leaving the station. One man, also a passenger by the s.s. "Karoa" died of Phthisis pulmonalis. He was in the last stages of the disease when admitted to the station and died before his removal could be carried out.

INFECTIOUS DISEASES HOSPITAL.

The number of cases treated in the Infectious Diseases Hospital at Gulioni is shewn in Table XI It will be seen that many other

TABLE IX.

Return of Persons Quarantined during 1917.

	Remaining	Admitted	Discharged	Died	Remaining	Total	Largest No. on one day	No. of days station occupied	Remarks.
Whole Year ..	78	2079	2155	2	..	2157	1254	116	
January ..	78	82	160	..	..	160	160	23	New crew ss. Barjora, 78. From Dec. 28—Jan., 19. Rejected porters from Dar-es-Salaam. 6. From Jan. 11—20. Old crew ss. Barjora, 76. From Jan. 19---23.
May ..	..	1335	677	..	658	1335	1254	27	ss. Worsley Hall, 81. Mombasa, Plague, May. 5—7. ss. Karoa, 1254. Bombay, Small Pox, May 7--June 2.
June ..	658	276	933	1	..	934	658	18	ss. Pundua, 276. Bombay, Small Pox, June 4---18.
July - August ..	..	262	262	..	..	262	262	19	ss. Hong Wan I, 276. Mombasa, Wakikuyu from Nairobi, July 30—Aug. 18.
Sept. - October ..	..	48	48	..	..	48	48	17	ss. Huntscliffe 48. Mombasa, K. A. R. Recruits from Nairobi. From Sept. 15—Oct. 1.
December ..	..	76	75	1	..	76	76	12	ss. Barjora 76. Dar-es-Salaam, K.A.R. Recruits from G.E.A. From Dec. 4---16

TABLE X.

Return of Cases Treated at Prison Island Hospital, 1917.

Diseases	Admitted	Discharged	Died	Remarks.
Cerebro-spinal Meningitis ..	2	1	1	Discharged to Gulioni.
Dysentery ..	7	7	..	
Malaria ..	17	17	..	
Measles ..	5	5	..	To Gulioni.
Pneumonia ..	1	1	..	,,
Phthisis pulmonalis ..	1	..	1	
General debility ..	1	1	..	
Rheumatism ..	7	7	..	
Asthma ..	1	1	..	
Bronchitis ..	11	11	..	
Stomatitis ..	1	1	..	
Tonsillitis ..	1	1	..	
Constipation ..	6	6	..	
Diarrhœa ..	6	6	..	
Cellulitis ..	1	1	..	
Ulcers ..	1	1	..	
Scabies ..	3	3	..	
Total..	72	70	2	

TABLE XI.

Return of Cases Treated at the Infectious Diseases Hospital, 1917.

Diseases	Admitted	Discharged	Died	Remaining	Remarks
Cerebro-spinal Meningitis..	13	..	11	2	
Chicken Pox ..	42	39	..	3	
Dysentery ..	5	4	1	..	
Malaria ..	3	3	..	..	
Measles ..	20	20	..	..	
Mumps ..	2	2	..	..	
Small Pox ..	7	5	2	..	
Pnemonia ..	3	3	..	..	
Phthisis pulmonalis ..	1	..	1	..	
Pleurisy ..	2	..	2	..	
Constipation ..	4	4	..	..	
Diarrhœa ..	3	3	..	..	
Contacts ..	85	85	..	..	
Under observation ..	15	15	..	..	
Paupers ..	6	5	..	1	
	211	188	17	6	

than infectious cases are dealt with in this institution which serves as a segregation place for contacts of infectious disease, as a hospital for cases other than infectious cases removed from the Quarantine station, and at times as a resting place for paupers for the night who could not be removed to the more distant Poor House at Walezo.

VACCINATION.

It will be seen from the accompanying Table XII that the majority of the persons vaccinated were passengers on steamers or dhows. The results of the vaccination could unfortunately not be followed up in most of these cases. Owing to pressure in other directions little house to house vaccination could be attempted in the town but it is hoped that in 1918 a great deal more will be possible with the fuller staff which is anticipated by then.

RAT EXTERMINATION.

The system of collecting rats by purchase and poisoning was found to be not entirely satisfactory and was largely done away with early in the year, although not entirely abolished, and replaced by more systematic inspection of premises for rat runs which were filled in and by trapping.

All rats collected daily are labelled with the name of the place where caught or found for future reference if found to be infected. The sex of each is determined and unless decomposed each is dissected and a smear made from the spleen for examination later in the laboratory for bacillus pestis.

Details regarding the rats collected during the year are given in Table XIII. It may be noted that only 30% of the rats coming under observation are males and it seems reasonable to take this as being the proportion the sexes bear to one another in the general rat population. Only a small proportion of the rats collected being alive, as it is found that the jaw traps usually are the most effective, the number of live males which it would be possible to liberate according to the Rodier plan is so small that they could have no possible influence on the proportion of the sexes in the rat population. Further with the best efforts it is highly improbable that more than a

TABLE XII.

VACCINATIONS, 1917.

Month	In Port		In Town	Total
	Steamers	Dhows		
January ..	97	341	73	511
February ..	54	304	71	429
March ..	76	390	77	543
April ..	10	208	109	327
May ..	1297	63	14	1374
June ..	319	100	52	471
July ..	28	250	81	359
August ..	39	203	35	277
September ..	35	291	38	364
October ..	..	244	...	244
November ..	166	113	7	286
December ..	124	95	4	223
	2245	2602	561	5408

very small percentage of the rats in the town are caught. Little good it is considered would result from a renewal of the experiment on the Rodier system which was started in 1914 by Major Skelton but had to be abandoned owing to the appearance of plague. It may be noted that the object aimed at in the Rodier system is by only killing the female rats and liberating all males to bring about such a preponderance of males over females in the population that the natural extermination of the species results.

TABLE XIII.

Varieties of Rats collected showing Proportion of Males to Females, etc.

	Decumanus	Rattus	Others	Total	Remarks.
Total collected ...	5,402	6,311	10,423	22,136	
Males ...	1,611	1,934	3,182	6,727	30·1% of total rats.
Females ...	3,791	4,377	7,241	15,409	69·9% ,, ,,
Pregnant Females...	451	460	638	1,549	10·0% of all females.
Foetuses ...	2,693	2,920	4,068	9,681	6·25 per pregnant female.
Spleen smears examined microscopically	3,568	3,897	6,182	13,647	61·5% examined of all rats collected: none found infected.

PART IV.—BACTERIOLOGICAL LABORATORY.

In the absence of an Assistant Medical Officer of Health and Bacteriologist only the routine work of examining rat spleen smears for bacillus pestis, blood films for malaria, sputa for tubercle bacilli, fæces for ankylostome ova, etc., and various other kinds of clinical material for various purposes, could be undertaken. Owing to the many calls on the time of the Medical Officer of Health little could be done in the way of Bacteriology, or of Milk and Water analyses. It is hoped that the vacancy for a Bacteriologist will be filled before long. Much work of a routine nature, such as the chemical and bacteriological examination of milk and water, in addition to that undertaken in 1917, as well as a large field for original research awaits him.

The work done in this laboratory is summarised in Table XIV.

TABLE XIV.

Bacteriological Laboratory Return, 1917.

Materials	No. examinations	Remarks.	
Blood smears for Malaria ...	272	Sub-tertian present	69
		Benign tertian present	35
			104
Faeces ...	563	Ankylostoma duodenale	360
		Entamoeba hystolitica	23
		Ascaris lumbricoides	13
		Lamblia intestinalis	2
		Taenia saginata	2
			400
Sputa ...	79	Tubercle bacilli	24
Throat smears for diplococci ...	75	Diplococci? meningitidis	36
Urethral smears ...	24	Gonococci	21
Nasal scrapings for b. lepra ...	8	All negative	
Pus smears ...	2	Staphylococci	2
Cerebro-spinal fluid ...	10	Dip. intracellularis	4
Chancre smears ...	7	Spirochaeta pallida	2
Urines for analysis ...	6		
Urines for Bilharzia ...	5	Ova of Bilharzia	2
Spleen smears of rats for bac. pestis ...	13,647		
Total...	14,698		

PART V.—VITAL STATISTICS.

The population of Zanzibar and Pemba at the last census taken in 1910 is given in Table XV. There is reason to believe that these figures were not entirely reliable at the time the census was taken and as eight years have elapsed very little reliance can now be placed on them. Under the Registration of Male Persons Decree, 1917, an approximate estimate of the population of the town of Zanzibar was obtained. This estimate places the population of Zanzibar town at 32,192 in 1917, a decrease of 2,630 on the figure at the time of the census in 1910, whereas an estimate based on the excess or otherwise of births over deaths since the last census places the population in 1917 at 29,441 a decrease of 5,381. It is of course impossible to found any reliable vital statistics on such a basis as this and the necessity for a fresh census is imperative.

In Table XVI comparison is made between the births and deaths registered in each district of Zanzibar from 1912 to 1917.

From this Table it will be seen that the deaths registered exceed the births registered during these six years by no less than 8,035, the excess of deaths over births being most marked in the Town where it is 4,281, in the Mwera District the excess is almost as great, 3097, in the Chwaka district the excess is 422 and in the Mkokotoni District it is 235.

This Table also shews that whereas the deaths registered in each district have remained more or less constant each year, the births registered in the Town show a fairly regular decrease year by year, on the other hand the births registered in all the other districts shew a fairly well marked and regular increase especially in the Mkokotoni District where the number of births registered in 1917 is treble the number registered in 1914.

The obvious explanation would seem to be defective registration which is undoubtedly the chief if not the only reason as far as the districts other than the Town are concerned. This seems to be fairly well proved by the steady rise in the number of births registered in these districts year by year as more care was taken over the registration of births, the difference between the increase in the different districts being possibly an indication of the zeal with which the work was undertaken.

With regard to the Town defective registration alone cannot account for the most unsatisfactory figures relating to births although it undoubtedly plays a very large part and will continue to do so until the method of collecting information regarding births in this district is entirely remodelled. That the existing methods of collecting information of births in the Town are very defective, especially among the Swahili population in 'Ngambo, is proved by the rarity with which a birth is registered which is not also a death among this class. In round figures the proportion of deaths to births among Swahilis is 30 deaths to one birth. The second factor which

accounts for the number of births registered being small is one which is more difficult to overcome than defective registration. It is that the actual number of births is small among the Swahili population. There can be no other explanation for the extraordinary dearth of children which must immediately attract the attention of the most casual observer walking through the 'Ngambo district and which is in the most marked contrast to the conditions found in the shamba villages, such for example as Donge in the Mkokotoni district, where as in most native villages and towns, children are such a prominent feature, unless it is assumed that almost all children born here die off within a few months of their birth.

The causes of the small actual birth rate in the N'gambo district are probably venereal disease and promiscuous sexual intercourse and the use of abortifacients. These are factors which are more likely to prevail in the Town districts than in the shambas and there is little doubt that all are playing an active part in 'Ngambo.

Table XVII shew the births and deaths in each district of Zanzibar divided up according to sex.

Table XVIII shew the number of births and deaths registered during 1917 in each of the districts of Zanzibar and Pemba, with the birth and death rates calculated on the population figures of the 1910 census. These rates are apt to be misleading unless the fallacies connected with inaccurate registration and unreliable population figures are taken into consideration.

This Table also gives the infantile mortality figures for each district. The infantile mortality figure is the number of deaths of infants under one year of age during the year to 1000 births during the same period. It is calculated as follows—

$$\frac{\text{deaths under one year} \times 1000}{\text{births during year}}$$

This figure should be a valuable indication of the healthiness or otherwise of a locality but in this instance being based on inaccurate data it is valueless except perhaps for comparison of one year with another.

These very unsatisfactory statistics emphasise the real necessity for an accurate census to be taken as soon as possible and for energetic steps to be adopted for securing proper registration of births and deaths.

Table XIX gives the monthly distribution of deaths in the various districts of Zanzibar for 1917 compared with the averages for the preceding five years.

It may be noted that during 1917 the average number of deaths per month—284—was exceeded in March, May, June, July, October and November. The monthly average number of deaths in the preceding five years—276—was exceeded in July, August, October, November and December.

The smallest number of deaths in any one month during 1917 occurred in February—165. The smallest average number in any one month for the preceding five years also occurred in February—208·8.

The largest number of deaths in one month in 1917 took place in May—349—whereas the highest number in the averages for any one month for five years previous—352·6—was for November.

The deaths which occurred at Walezo Asylum have been excluded from this and the next table, the records being incomplete.

In Table XX the deaths registered in Zanzibar Town during the last five years are shewn divided up according to the age at death. These figures may be taken to be only approximate as the age at death is usually arrived at by guess work.

In Table XXI the deaths registerəd during 1917 have as far as possible been corrected according to the locality where death actually took place. As will be seen these corrections reduce the death rate for Zanzibar Town from 36·0 to 31·4 per 1000.

In Table XXII the deaths registered in Zanzibar Town have been divided up to shew the exact locality where death took place. The districts "A", etc., refer to the districts of the Town briefly described in the opening paragraphs of Part I.

It will be noted that 608 or more than half of the deaths which actually took place in the Town—1180—the deaths under the heading "Other Places" being excluded—occurred in the "D" or 'Ngambo district in private houses.

Table XXIII gives the causes of deaths registered in Zanzibar Town during 1917. The certificates of qualified medical practitioners who have been in attendance on the deceased during his last illness are the only sources from which the information necessary to compile this table has been obtained. All deaths not so certified have been placed under "Undefined Causes".

Roughly only one third of the deaths registered in Zanzibar Town and practically speaking none of those registered in other districts of Zanzibar or in Pemba are certified by medical men. This being so the information available as to the chief causes of death in the Protectorate is particularly scanty and concerns only some 7% of the deaths registered. The figures in this Table can therefore only be taken as a rough indication and as nothing more. They have at least the merit of being based on reliable information and not on the diagnosis of an unqualified person who has to rely on the crude tale of the relatives of the deceased regarding his last illness. This defect can only be cured by getting into closer touch with the people, gaining their confidence and encouraging them to seek skilled advice in district dispensaries and hospitals.

TABLE XV.

Population of Zanzibar and Pemba,—Census 1910.

	Males	Females	Children	Total
Zanzibar.				
Zanzibar Town	15,122	14,304	5,396	34,822
Mwera District	11,239	13,206	4,656	29,101
Chwaka District	5,617	7,458	4,553	17,628
Mkokotoni District	11,013	14,242	6,818	32,073
Total	42,991	49,210	21,423	113,624
Pemba.				
Chake Chake District	10,757	13,597	8,958	33,312
Weti District	11,416	11,002	8,307	30,725
Mkoani District	6,290	7,295	5,487	19,072
Total...	28,463	31,894	22,752	83,109
Grand Total...	71,454	81,104	44,175	196,733

TABLE XVI.

Births and Deaths Registered,—Whole Island, 1912 to 1917.

(deaths at Walezo Asylum are *not* included in this return).

	Town.		Mkokotoni.		Chwaka.		Mwera.	
	Births	Deaths	Births	Deaths	Births	Deaths	Births	Deaths
1912	518	1211	580	1118	251	706	186	1071
1913	576	1022	634	889	287	328	253	766
1914	401	1239	511	801	245	299	190	721
1915	332	955	1023	1005	426	378	458	829
1916	296	1108	1099	881	490	396	469	814
1917	305	1174	1559	947	430	444	392	844
Total...	2428	6709	5406	5641	2129	2551	1948	5045
Excess of deaths over births ...	4281		235		422		3097	

TABLE XVII.

Sex Distribution of Birth and Deaths registered,—Zanzibar, 1917.

	Births.			Deaths.		
	Male	Female	Total.	Male	Female	Total.
Zanzibar Town ...	167	138	305	711	544	1255
Mwera	211	181	392	370	474	844
Chwaka	215	215	430	206	238	444
Mkokotoni	780	779	1559	422	525	947
Total...	1,373	1,313	2,686	1,709	1,781	3,490

TABLE XVIII.

District	Population Census 1910	Births		Deaths		Infantile Mortality	
		Number registered	Rate per 1000	Number registered	Rate per 1000	Deaths under 1 year	Rate per 1000 Births
Zanzibar							
Zanzibar Town ..	34,822	305	8·7	1,255	36·0	104	342·3
Mwera District ..	29,101	392	13·5	844	29·0	52	132·8
Chwaka District ..	17,628	430	24·4	444	25·1	50	116·5
Mkokotoni District ..	32,073	1,559	48·6	947	29·5	154	99·0
Total ..	113,624	2,686	23·6	3,490	30·8	360	134·0
Pemba							
Chake Chake District ..	33,312	678	20·4	548	16·4	no figures	available
Weti District ..	30,725	329	10·7	385	12·5	,,	,,
Mkoani District ..	19,072	445	23·4	241	12·6	,,	,,
Total ..	83,109	1,452	17·6	1,174	14·1	..	..
Grand Total ..	196,733	4,138	21·0	4,664	23·8	..	..

TABLE XIX.

Seasonal distribution of deaths registered during 1917 compared with the averages for the years 1912 to 1916.—Zanzibar Island.
(deaths at Walezo are *not* included in this return)

	Town	Mwera	Chwaka	Mkokotoni	Total
January ...	94	54	24	67	239
Average 5 years ...	77·0	59·6	30·4	68·0	235·0
February ...	51	40	25	49	165
Average 5 years ...	76·0	48·8	21·0	63·0	208·8
March ...	114	79	34	63	290
Average 5 years ...	81·2	51·8	22·6	61·2	216·8
April ...	90	68	39	63	260
Average 5 years ...	82·8	61·8	27·4	65·8	237·8
May ...	122	65	62	100	349
Average 5 years ...	95·2	67·0	28·2	82·8	273·2
June ...	152	71	42	80	345
Average 5 years ...	105·0	58·4	26·4	81·2	271·0
July ...	98	77	46	82	303
Average 5 years ...	101·8	72·0	34·2	91·4	299·4
August ...	94	66	34	89	283
Average 5 years ...	106·2	81·6	33·4	88·0	309·2
September ...	84	83	35	81	283
Average 5 years ...	89·0	83·8	30·8	69·6	273·2
October ...	90	73	33	115	311
Average 5 years ...	109·8	99·2	37·4	99·8	346·2
November ...	89	91	40	78	298
Average 5 years ...	93·6	92·2	67·8	99·0	352·6
December ...	96	77	30	80	283
Average 5 years ...	89·4	64·0	61·4	69·0	283·8
Total 1917 ...	1174	844	444	947	3409
Average Total ...	1107·0	840·2	421·0	938·8	3307·0

TABLE XX.

Age Distribution of Deaths Registered in Zanzibar Town for the last 5 years.
(deaths at Walezo Asylum are *not* included in this return)

	1917	1916	1915	1914	1913
Under 1 year ...	104	93	82	123	81
1 to 5 ,, ...	67	68	46	70	56
6 to 10 ,, ...	28	10	19	32	32
11 to 20 ,, ...	51	59	45	77	46
21 to 30 ,, ...	167	158	124	202	151
31 to 40 ,, ...	230	230	204	237	207
41 to 50 ,, ...	175	171	148	198	152
51 to 60 ,, ...	113	95	80	77	94
61 to 70 ,, ...	53	57	61	37	70
Over 70 ,, ...	181	165	141	170	133
Unknown	5	1	5	16	...
	1174	1108	955	1239	1022

TABLE XXI.

Deaths in Zanzibar corrected for the Locality where they occurred,—1917.

ZANZIBAR TOWN				
Total deaths registered		1255	Rate per 1000	36·0
Less deaths at Walezo	81			
,, ,, Mwera district	64			
,, ,, Chwaka ,,	1			
,, ,, on ships	10			
,, ,, in Quarantine	2			
		158		
Corrected total		1097	Rate per 1000	31·4
MWERA DISTRICT				
Total deaths registered		844	Rate per 1000	29·0
Add deaths at Walezo	81			
,, ,, registered in town	64			
		145		
Corrected total		989	Rate per 1000	34·0
CHWAKA DISTRICT				
Total deaths registered		444	Rate per 1000	25·1
Add deaths registered in town	1			
		1		
Corrected total		445	Rate per 1000	25·1
MKOKOTONI DISTRICT				
Total deaths registered		947	Rate per 1000	29·5

TABLE XXII.

Locality where Deaths occurred Registered in Zanzibar Town during 1917.

INSTITUTIONS		
European Hospital	2	
Native Government Hospital	69	
Mkunazini Hospital	11	
Infectious Diseases Hospital	17	
Kilimani Gaol	3	
Lunatic Asylum	10	
Ziwani K. A. R. Lines	8	
Walezo Leper Asylum	17	
Walezo Poor House	64	
Quarantine Station, Prison Island	2	
		203
PRIVATE HOUSES		
"A" district	43	
"B" ,,	198	
"C" ,,	128	
"D" ,,	608	
		977
OTHER PLACES		
On board ships in the port	10	
In Mwera district	64	
In Chwaka district	1	
		75
Total		1255

TABLE XXIII.

General Causes of Deaths—Zanzibar Town, 1917.

INFECTIVE DISEASES.	
Cerebro-spinal Fever	19
Dysentery	21
Erysipelas	1
Malaria	28
Malaria, chronic	3
,, , Blackwater Fever ...	4
Pneumonia	23
Sapraemia	1
Septicaemia	4
Small-Pox	2
Syphilis, Tertiary	1
,, , Inherited	2
Tetanus	2
Tuberculosis	41
Undefined Fever	2
GENERAL DISEASES.	
Anæmia	1
Diabetes	1
Rickets	1
Debility	21
Malnutrition	1
LOCAL DISEASES.	
Diseases of the Nervous System.	
Cerebral Abscess	1
Cerebral Hæmorrhage	8
Cerebral Softening	3
Cerebral Thrombosis	1
Congestion of Brain	1
Convulsions	8
Eclampsia	1
Epilepsy	1
General Paralysis of the Insane ...	6
Meningitis	1
Diseases of the Eyes.	
Orbital Cellulitis and Panophthalmitis	1
Diseases of the Circulatory System.	
Endocarditis	4
Myocarditis	1
Valvular Heart Disease	5
Diseases of the Respiratory System.	
Acute Pulmonary Oedema ...	1
Asthma	2
Bronchitis	8
Broncho-pneumonia	2
Capillary Bronchitis	1
Emphysema	1
Carried forward ...	236

TABLE XXIII.

General Causes of Deaths, Zanzibar Town, 1917.—*Contd.*

	Brought forward ...	236
LOCAL DISEASES.—*(continued)*		
Diseases of the Respiratory System—(contd.)		
Laryngitis		1
Pleurisy		2
Pulmonary Embolism		1
Diseases of the Digestive System.		
Gangrenous Parotitis		1
Sub-Lingual Growth		1
Stricture of the Oesophagus ...		1
Malignant Disease of the Stomach ...		2
Sub-Phrenis Abscess		1
Peritonitic		2
Acute Hepatic Congestion ...		1
Chronic Hepatitis and Spleenitis ...		1
Cirrhosis of Liver		1
Hepatitis		3
Jaundice		1
Appendix Abscess		1
Diarrhœa		11
Enteritis		2
Gastro-enteritis		4
Fæcal Accumulation		1
Intestinal Obstruction		1
Hernia		2
Diseases of the Lymphatic System.		
Filarial Lymphangitis ...		1
Diseases of the Urinary System.		
Acute Nephritis		5
Chronic „		7
Acute Hæmoglobinuria and Suppression		1
Diseases of the Generative System.		
Parturition Shock		1
Premature Birth		1
Puerperal Fever		1
Uterine Fibroid-Hysterectomy ...		1
Diseases of Connective Tissues.		
Cellulitis		2
Injuries.		
Burns		3
Drowning		3
Fracture of Base of Skull ...		3
Fracture of Leg (Compound) ...		2
Gunshot Wounds		3
Hanging-Suicide		1
Suffocation		3
	Carried forward ...	315

TABLE XXIII.

General Causes of Deaths, Zanzibar Town, 1917.—*Contd.*

Brought forward ...	315
LOCAL DISEASES.—*(continued)*	
Poisons.	
Carbolic Acid-Suicide	1
Parasites.	
Ankylostomiasis	22
Lambliasis	1
UNDEFINED CAUSES...	916
Total...	1255

PART VI.—METEOROLOGY.

The following tables have been compiled from the returns published monthly by the Director of Agriculture. The returns for Zanzibar Town are furnished by Dr. Copland; the district returns by the district stations; the Kigomache returns by the Port Office observer the Banani returns by the Friends' Industrial Mission.

Table XXIV shews the rainfall in 1917 with the number of wet days each month in each of the three districts in Zanzibar and Pemba.

Table XXV gives the rainfall in Zanzibar month by month for the last eight years. It will be seen that the average rainfall amounts to 56·56 inches for this period, the highest average rainfall in any one month being in April—16·35 inches—and the lowest in July—1·37 inches.

In Table XXVI comparison is made between the meteorological observations made during 1917 at Zanzibar Town and at Banani, near Chake Chake in Pemba.

The highest absolute maximum temperature recorded during the year was 92·5 recorded at Banani in March as against 92·4 recorded at Zanzibar in the same month.

The lowest temperature recorded at Zanzibar was 70·0 in December; the lowest at Banani 71·0 in July and August.

The monthly mean maximum and minimum temperatures show little variation between the two places, the highest mean maximum —89·1—being recorded at Banani in March, the lowest mean minimum—73·1—at Zanzibar in August.

TABLE XXIV.

Rainfall return—Zanzibar and Pemba, 1917.

	Zanzibar						Pemba					
	Town		Mkokotoni		Chwaka		Banani		Weti		Kigomache	
January ...	2·20	11 days	3·40	5 days	5·66	8 days	6·49	13 days	5·97	8 days	3·47	4 days
February ...	4·29	10 „	4·64	6 „	5·33	7 „	2·26	9 „	3·60	4 „	0·00	0 „
March ...	4·46	16 „	5·17	7 „	4·86	7 „	4·48	10 „	3·81	10 „	1·12	3 „
April ...	16·49	24 „	20·49	27 „	12·90	6 „	21·54	28 „	19·26	26 „	22·51	18 „
May ...	10·63	17 „	10·39	19 „	11·54	13 „	21·41	25 „	22·52	24 „	12·85	16 „
June ...	4·20	6 „	2·61	6 „	1·71	7 „	4·40	16 „	4·02	8 „	3·78	10 „
July ...	1·23	7 „	1·24	5 „	0·39	1 „	3·37	20 „	2·32	10 „	3·57	8 „
August ...	2·05	7 „	3·20	7 „	0·26	3 „	2·10	13 „	1·90	5 „	0·97	4 „
September ...	2·01	7 „	6·22	17 „	0·19	3 „	0·03	1 „	0·43	2 „	3·54	7 „
October ...	2·27	6 „	4·15	17 „	0·16	2 „	0·52	2 „	2·34	4 „	3·15	8 „
November ...	6·79	14 „	11·64	7 „	8·38	5 „	2·65	8 „	2·29	4 „	0·56	2 „
December ...	0·44	5 „	1·31	3 „	0·05	2 „	6·40	6 „	4·61	9 „	0·42	1 „
Total ...	57·06	130 days	74·46	126 days	51·43	64 days	75·65	151 days	73·07	114 days	55·94	81 days

TABLE XXV.

Monthly Rainfall—Zanzibar Town, 1910 to 1917.

	1910	1911	1912	1913	1914	1915	1916	1917	Average
January ...	4·71	0·54	4·36	0·39	2·84	1·74	1·63	2·20	2·30
February ...	2·36	0·01	6·99	1·37	0·05	0·76	3·50	4·29	2·42
March ...	0·30	9·92	7·39	9·99	8·56	6·03	2·29	4·46	6·18
April ...	14·52	13·40	13·09	17·59	12·69	9·62	33·35	16·49	16·35
May ...	11·77	17·51	3·45	11·18	3·84	10·30	4·35	10·63	9·15
June ...	0·02	2·24	0·47	0·07	0·88	5·00	1·38	4·20	1·78
July ...	3·30	1·53	0·03	0·31	0·22	3·94	0·38	1·23	1·37
August ...	1·82	1·76	1·04	0·88	3·65	0·45	2·11	2·05	1·72
September ...	0·67	1·22	6·59	2·58	1·04	1·17	2·81	2·01	2·27
October ...	1·81	2·89	0·98	4·22	0·89	2·63	5·83	2·27	2·69
November ...	7·47	6·26	5·70	3·20	4·32	9·38	2·94	6·79	5·65
December ...	8·08	1·86	17·82	1·31	4·37	0·61	2·92	0·44	4·69
Total ...	56·83	59·14	67·91	53·09	43·35	51·63	63·49	57·06	56·56

TABLE XXVI.

Meteorological Observations—Zanzibar Town and Banani, Pemba, 1917.

	Zanzibar Town						Banani Pemba				
	Rainfall	Relative Humidity	Mean Maximum Temperature	Mean Minimum Temperature	Absolute Maximum Temperature	Absolute Minimum Temperature	Rainfall	Mean Maximum Temperature	Mean Minimum Temperature	Absolute Maximum Temperature	Absolute Minimum Temperature
January ...	2·20	75·09	86·9	79·0	89·2	76·0	6·49	87·7	78·8	90·0	75·0
February ...	4·29	76·92	86·3	78·6	89·6	70·8	2·26	87·8	79·2	91·0	73·0
March ...	4·46	75·77	86·9	79·0	92·4	74·6	4·48	89·1	79·3	92·5	75·0
April ...	16·49	83·06	83·2	76·1	86·8	74·2	21·54	83·8	77·0	87·5	75·0
May ...	10·63	79·06	83·4	75·4	86·2	72·1	21·41	83·7	75·8	86·0	72·0
June ...	4·20	77·07	82·7	74·3	84·4	72·3	4·40	83·4	75·4	87·5	73·5
July ...	1·23	78·58	82·6	73·4	84·9	72·1	3.37	82·9	74·4	85·0	71·0
August ...	2·05	77·10	82·3	73·1	85·0	71·9	2·10	82·9	73·6	84·0	71·0
September ...	2·01	73·83	84·2	74·2	86·7	72·8	0·03	84·3	74·3	87·0	73·0
October ...	2·27	73·58	83·6	74·8	86·4	73·0	0·52	85·0	75·2	87·0	73·5
November ...	6·79	73·53	85·4	77·3	89·3	74·0	2·65	86·6	77·4	88·0	75·0
December ...	0·44	71·29	86·9	79·6	89·4	70·0	6·40	87·7	78·1	90·0	75·0

PART VII.—GENERAL.

CONSUMPTION OF OPIUM.

Dr. de Mello in his report gives the following figures with regard to the number of consumers of opium during 1917.

Race.	Male.	Female.	Total.
Indians—			
Ismaili Khoja ...	28	46	74
Suni Mohammedans..	43	14	57
Ithnasheri Khoja ...	12	11	23
Banyans ...	20	2	22
Pathans ...	5	...	5
Baluchis ...	4	...	4
Rajputs ...	4	...	4
Bohora ...	2	...	2
Cingalese ...	2	...	2
Others—			
Swahili ...	96	5	101
Arabs ...	33	1	34
Persians ...	7	...	7
Gazijas ...	5	...	5
Somalis ...	2	...	2
	263	79	342

He reports that the number of habitues was considerably reduced towards the end of the year, some having died and others having left for G. E. A. or for India.

The average amount of opium consumed per month is about 14 lbs. the average consumption per head per month being about 1½ tolas. He finds that the Indian consumers are all of advanced age, the majority of the younger eaters being Swahilis or other African races.

A gradual reduction in the amount of opium supplied to habitues must be insisted on. This should be quite possible without causing any undue hardship except perhaps in the case of the aged. The issue of opium to habitues should also as far as possible be daily and no new licences should be granted to habitues coming from India for example. To grant such licences is only to encourage undesirables. If these points are attended to there is little doubt that in a short time the consumption of opium by habitues here will be practically negligible.

CARE OF PAUPERS.

The number of Paupers cared for at Walezo during the year was as follows—

	Male.	Female.	Total.
In Poor-house on Jan. 1 ...	34	21	55
Admitted during year ...	65	34	99
Total ...	99	55	154
Died during year ...	47	17	64
Discharged ...	18	10	28
Escaped ...	16	4	20
Remaining on Dec. 31 ...	18	24	42
Total ...	99	55	154
Average number daily ...	24	24	48

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